



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20530
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 616,372	07 13 2000	Atsushi Komura	1-50	6846

23400 7590 08 14 2002

LAW OFFICES OF DAVID G. POSZ
2000 L STREET, N.W.
SUITE 200
WASHINGTON, DC 20036

EXAMINER

SOUW, BERNARD E

ART UNIT PAPER NUMBER

2881

DATE MAILED: 08 14 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/616,372

Applicant(s)

KOMURA ET AL.

Examiner

Bernard E Souw

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) 1-5, 8-16 and 19-22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 13 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 07/13/2000 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the English translation is not provided by the Applicant. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

Specification

2. The abstract of the disclosure is objected to because it is not descriptive enough. The wording "thickness of the gate oxide film is **measured** by **controlling** a left period of time from the formation of the gate oxide film to the measurement" is not understandable by a person of ordinary skill in the art: *how to **control** the left period of time, and how to **measure** anything **by** such a control?*

Correction is required. See MPEP § 608.01(b).

3. While applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See *In re Hill*, 161

F.2d 367, 73 USPQ 482 (CCPA 1947). The term "*left period of time*" in all claims and throughout the entire specification is used by the Applicant to mean "*time for which the film is left to stand after formation*" (see Marumo et al., USPAT 6,331,890 B1, Fig.17, Col.1/ll.53-54), or "*time of exposure to ambient environment*" (see Chen et al., USPAT 6,303,397 B1, Fig.2, Col.3/ll.66-67 & Col.4/ll.1-29), while the accepted meaning is *obscure* because it is not in proper language.

4. The disclosure is objected to because of the following informalities:

- ▶ On pg. 8/line 2: The wording "*T is a change-variation in thickness ...*" is not understandable, because of the estranged terminology "*change-variation*". It is generally understood that a *change* is inherent to any kind of *variation*, and that a *variation* is inherent to any kind of *change*, thus rendering the terminology "*change-variation*" indefinite.
- ▶ On pg. 8/line 4: The wording "*The variation is calculated at 3σ* " is not understandable, and/or not used in conventionally accepted meaning in the statistics: a variation can be determined from results of measurements, but not calculated, unless the distribution function is previously known. It is not clear where Applicant might have obtained the distribution here being referred.
- ▶ On pg. 8/line 4: The parameter " σ " is not explained in the entire specification, including the claims.
- ▶ On pg.15/lines 25-26: Where the meaning of "*change-variation*" is already not understandable, the wording "*rate of change-variations*" is here even more confusing.

A more detailed explanation of the words "*rate*", "*change*" and "*change-variation*" is here required. While applicant may be his or her own lexicographer, a term may not be given a meaning repugnant to the usual meaning of that term. See *In re Hill*, 161 F.2d 367, 73 USPQ 482 (CCPA 1947).

Appropriate corrections are required.

However, Applicants are cautioned not to introduce New Matter in obviating the above objections.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 3, 10, 14 and 21 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Interpreted in light of the specification, claims 3, 10, 14 and 21 do not recite any method that can be claimed, but just an equation or formula, which is not invented by Applicant but is widely known in the art in various forms of empirical formulas, as admitted by Applicant himself on pg.15/ll.17-20, and evidenced by Huang (USPAT 6,221,790 B1) in Fig.2 and Col.2/ll.11-25.

Given a behavior shown in Huang's Fig. 2, it would have been obvious to one of ordinary skill in the art at the time the invention was made to derive an empirical formula such as Applicant's. The behavior shown in Huang's Fig. 2, approximated by whatever mathematical form, is a result of natural law, which always occurs without any active

manipulation by the Applicant. As such, it belongs to non-statutory subject matter that cannot be claimed.

6. Claims 4, 11, 15 and 22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Interpreted in light of the specification, claims 4, 11, 15 and 22 do not recite any method that can be claimed, but just an equation or formula, which is widely known as a basic formula in the field of statistics, expressing the addition of two statistically independent variances T^2 and S^2 , one resulting from the process of measuring the film thickness that produces a variation in the apparent thickness T , the other resulting from the process of forming the oxide film that produces a variation in the physical thickness S . The mathematical formula recited in Applicant's claim is merely a statistical formula that will always be found without any active manipulation from the Applicant. As such, it belongs to non-statutory subject matter that cannot be claimed.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1, 5, 12 and 16 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as

to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The particular method how to control the left period of time is not described by the Applicants, neither in the claims nor in the specification..

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 5, 12 and 16 are also rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants do not explain, neither in the specification nor in any of the claims,, how to *measure a thickness by irradiating* the object with light. It is further unclear, how a thickness can be *measured in accordance* with the left period of time.

10. Claims 2, 9, 13 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant fails to particularly point out and distinctly claim, how to make appropriate *correction* (on the measured thickness of the oxide film) *based on* the left period of time.

11. Claims 3, 10, 14 and 21 are rejected under 35 U.S.C. 112, first paragraph, in addition to the previous rejection under 35 U.S.C. 101, as containing subject matter

which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Neither the specification nor any of the claims teaches how to obtain the factor "*a*" required to calculate the real thickness according to Applicant's formula, $b = y - a \ln(t)$ where *b* is the real thickness of the oxide film, *y* the measured value of thickness, and *t* is the left period of time. The claim language that "*a is a constant determined based on atmosphere around the oxide film*" does not teach any prospective user how to make and/or use Applicant's invention.

Applicant is expressly cautioned not to introduce New Matter in obviating this 35 U.S.C. 112, first paragraph rejection.

12. Claims 3, 10, 14 and 21 are also rejected under 35 U.S.C. 112, second paragraph, in addition to the previous rejections under 35 U.S.C. 101 and 35 U.S.C. 112, first paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

If "*b*" is already known as the *real* thickness of the oxide film, as recited in the claim, as well as in the specification, as admitted on pg. 10 lines 3-4 "*The constant b is a thickness of the oxide film measured immediately after the gate oxide film 8 is formed*" why would anyone spend more time and energy for measuring the parameter once again, using Applicant's suggested method and/or formula?

13. Claims 4, 11, 15 and 22 are also rejected under 35 U.S.C. 112, second paragraph, in addition to the previous rejection under 35 U.S.C. 101, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is fully unclear, how an oxide *thickness could be measured to include a change variation* in T. It is ultimately unclear, **what** is particularly claimed in claims 4, 11, 15 and 22. Interpreted in light of the specification, claims 4, 11, 15 and 22 do not recite any method that can be claimed, but just an equation or formula, which is furthermore widely known and can be found in many textbooks on statistics.

14. Claims 8 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The particular method how to control the left period of time is not described by the Applicants, neither in the claims nor in the specification. Furthermore, the particular method how to "***measure in accordance with the left period of time***" is not adequately described, neither in the specification nor in the claims, thus rendering the claims indefinite.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2881

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Insofar as the Examiner can ascertain beyond the above § 112 rejection, claims 1, 5, 12, and 16 are rejected under 35 U.S.C. 102(a) and (e) as being anticipated by Huang (USPAT 6,221,790 B1).

Huang discloses a method for measuring thickness of an oxide film, as recited in Col.1/II.5-7. Huang's method is based on a Prior Art (Rudolph Corp.), as recited in Col.2/II.11-25. Huang's Prior Art's method comprises:

- forming an oxide film on a substrate, as recited in Col.1/II.5-7;
- controlling a left period of time for leaving the oxide film from the formation of the oxide film to measurement of its thickness by counting the elapsed days and/or hours since the oxide's formation, as illustrated in Fig.2 showing elapsed (=left) times from 0 to 150 days and from 150 days to about 315 days;
- measuring the thickness of the oxide film by irradiating the oxide film with light, as recited in Col.2/II.11-16, in accordance with the "*left period of time*", as shown in Huang's Fig.2.

- especially regarding claims 5 and 16, the step of washing (i.e., cleaning) the oxide surface prior to conducting thickness measurements is shown in Fig.2 and recited in Col.2/ll.18-23, i.e., 150 and/or 315 days after the formation of the oxide film prior to starting a thickness measurements, as recited in Col.2/ll.19-25.
- especially regarding claims 12 and 16, the additional steps of "*determining whether the oxide film thickness falls in a desirable range*", and "*performing a succeeding step for manufacturing the semiconductor device when the oxide thickness falls in the desirable range*" are quite trivial for being inherent and/or conventional in almost every semiconductor manufacturing process.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Insofar as the Examiner can ascertain beyond the above § 112 rejection, claims 2, 9, 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang and his PA.

Huang recites all the limitations of claims 2, 9, 13, and 20, except the recitation of correcting the thickness of the oxide film based on the "*left period of time*" to obtain a real thickness of the oxide film. However, given the knowledge of apparent thickness

increase as shown in Fig.2, tracing back the apparent thickness to its initial value is the most primitive and straightforward way obvious to one of ordinary skill in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to correct the thickness of the oxide film based on the "*left period of time*" shown in Huang's Fig.2, since such a corrective action involves only routine skill in the art.

One would have been motivated to obtain the correct oxide thickness, since this parameter is crucially important for the proper function of a semiconductor device, as implicated by Huang in col.1/ll.12-34.

17. Insofar as the Examiner can ascertain beyond the above § 101 and § 112 rejections, claims 3, 10, 14, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang and his PA.

Huang recites all the limitations of claims 3, 10, 14, and 21, except the recitation of correcting the thickness of the oxide film by means of a formula which is not invented by Applicant but is widely known in the art in various forms of empirical formulas, as admitted by Applicant himself on pg.15/ll.17-20, and evidenced by Huang in Fig.2 and

It would have been obvious to one of ordinary skill in the art at the time the invention was made to correct the thickness of the oxide film according to any empirical formula to Huang's Fig.2, since such a corrective action is the most simple and primitive method of correction that only involves routine skill in the art.

18. Insofar as the Examiner can ascertain beyond the above § 101 and § 112 rejections, claims 4, 11, 15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang and his PA.

Huang recites all the limitations of claims 4, 11, 15 and 22, except the recitation of an equation widely known as a basic formula in the field of statistics, expressing the addition of two statistically independent variances T^2 and S^2 , one resulting from the process of measuring the film thickness that produces a variation in the apparent thickness T , the other resulting from the process of forming the oxide film that produces a variation in the physical thickness S .

It would have been obvious to one of ordinary skill in the art at the time the invention was made to observe and confirm that Applicant's results of measurements do follow a well known and well established statistical formula, since such an observation only involves routine skill in the art.

19. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang as applied to claims 5 and 16 above.

As shown in Fig.2, Huang's PA **controls** by counting the days and hours "*a left period of time*" for leaving the oxide film from **washing of the surface** performed on the 150th and 315th day in Fig.2, and then measures the thickness of the oxide film "*in accordance with the left period of time*" and generate the graph of Fig.2 showing the results of thickness measurement in dependence of the "*left period of time*".

It would have been obvious to one of ordinary skill in the art at the time the invention was made to wash the oxide surface and then follow-up with taking thickness measurements, because it is well known in the art that the result of a thickness measurement depends on the "*left period of time*", as evidenced by Huang in Fig.2.

20. Claims 6, 7, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang as applied to claims 5 and 16 above, and further in view of Torii et al. (USPAT 5,972,862).

► Huang recites all the limitations of claims 6 and 17, except the recitation of washing the oxide surface using a solution containing at least one of H_2SO_4 and HCl .

Torii et al. teach that washing an oxide surface may be performed by using a cleaning liquid containing sulfuric acid (H_2SO_4) and chloric acid (HCl), as recited in Col.5/ll.22-30.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to clean an oxide surface using a solution containing at least one of H_2SO_4 and HCl , since such solution is a standard cleaning solution well known in the art.

► Huang recites all the limitations of claims 7 and 18, except the recitation that the cleaning solution of claims 6 and 17 is one of a mixed solution of H_2SO_4 and H_2O_2 , and a mixed solution of HCl and H_2O_2 .

Using or adding H₂O₂ (hydrogen peroxide) in an oxide cleaning solution is well known in the art, as disclosed by Huang in Co.2/II.21-23. Further support for this Official Notice is provided by Morinaga et al. (USPAT 5,885,362), as recited in Col.13/II.63-67.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add H₂O₂ (hydrogen peroxide) into Torii's oxide cleaning solution, since such an addition is a well known in the art.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
July 29, 2002


JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800